

Requested Patent: GB462332A

Title: IMPROVEMENTS IN REFRACTOMETERS ;

Abstracted Patent: GB462332 ;

Publication Date: 1937-03-08 ;

Inventor(s): ;

Applicant(s):

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COMPANY LTD ;

Application Number: GB19350025063 19350909 ;

Priority Number(s): GB19350025063 19350909 ;

IPC Classification: ;

Equivalents: ;

ABSTRACT:

PATENT SPECIFICATION



Application Date : Sept. 9, 1935. No. 25063/35.

462,332

Complete Specification Left: Sept. 9, 1936.

Complete Specification Accepted: March 8, 1937.

PROVISIONAL SPECIFICATION

Improvements in Refractometers

We, THE RAYNER OPTICAL COMPANY LIMITED a British Company, ERNEST NOEL HOBSON and ALBERT JONAH BATEMAN, both British Subjects, all of 100, New Bond Street, London, W.1, do hereby declare the nature of this invention to be as follows:—

This invention relates to refractometers for measuring the refractive indices of substances, especially of solids and liquids, and relates more particularly to refractometers of the critical angle type. In such instruments, as it is necessary to employ a refracting medium having a higher refractive index than that of the substance to be tested, it is desirable to employ a medium having as high a refractive index as possible; such substances are in themselves costly and hitherto it has been found necessary to employ a refracting medium of considerable size which has to be optically ground to produce the surfaces embodying a spherical or cylindrical surface to direct the light in the required directions. Further, the graduated scale employed in known devices is embodied in and forms part of the optical system; considerable care has therefore to be exercised in its preparation. The object of the present invention is to provide a refractometer of the above type of simple construction having a refracting medium which is considerably smaller than those hitherto employed. Another object of this invention is to provide improved viewing means for reading the refractive index of the substance being tested, and to this end according to the present invention the refractometer comprises a refracting medium of prismatic or triangular form and of small size, a lens disposed adjacent to one face of the prism, having spherical or cylindrical surfaces, an optical viewing system comprising one or more lenses, a mirror and a graduated scale of simple form disposed exterior to the optical system but so arranged that the refractive index of the substance being tested may be viewed in the mirror and read off on the graduated scale.

According to one embodiment of this invention the refractometer comprises a

[Price 1/-]

narrow box or casing so formed that light can enter at its front end, said box being provided on its upper surface adjacent its rear end with an upwardly projecting eye-piece and on the same surface adjacent the front end with a longitudinally disposed slot. A small triangular prism, composed of a medium having a high refractive index; for example, diamond, provided with two flat and polished surfaces, is mounted within the box in such a manner that one of the polished surfaces projects slightly through the slot in the box. A lens having a flat face and a spherical or cylindrical surface is mounted to the rear of the prism so that the flat surface thereof is disposed adjacent and parallel to the second polished face of the prism. The third face of the prism is directed at an angle downwardly towards the front of the box. The optical viewing system, in addition to the eye-piece on the box, comprises within said box a lens mounted to the rear of the spherical or cylindrical lens and a mirror mounted to the rear of the lens and at an angle of about 45° to the axis thereof so that light which is transmitted through the lenses from the prism is reflected by the mirror up into the lens of the eye-piece on the box. A plane sheet of glass having a graduated scale engraved or otherwise produced thereon is mounted within the box below the mirror and at right angles to the axis of the eye-piece so that when viewed through the eye-piece the scale is seen disposed along one side of the mirror, which side is left unsilvered for this purpose. The interior of the base of the box below the sheet of glass bearing the graduated scale is either painted white or has a sheet of white material fixed thereto to reflect light from the front end of the box through said scale and up into the eye-piece, or if desired an aperture may be provided in the base of the box below the scale, through which aperture light from a suitable source of illumination may be directed on to the scale and up into the eye-piece.

If desired, instead of the scale being seen disposed along the side of the mirror as above described, the whole surface of

the mirror is only thinly silvered so as to permit the scale located below the mirror to be seen through said mirror, or alternatively said scale may be produced on
5 or carried by a non-transparent support, a mirror being arranged to illuminate the upper surface thereof so that it may be

viewed through the optical system as above described.

Dated this 9th day of September, 1935.

PHILLIPSS,

Chartered Patent Agents,

70, Chancery Lane, London, W.C.2,

For the Applicants.

COMPLETE SPECIFICATION

Improvements in Refractometers

10 We, THE RAYNER OPTICAL COMPANY LIMITED a British Company, ERNEST NOEL HOBSON and ALBERT JONAH BATEMAN, both British Subjects, all of
15 100, New Bond Street, London, W.1, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

20 This invention relates to refractometers for measuring the refractive indices or substances, especially of solids and liquids, and relates more particularly to refractometers of the critical angle type.
25 In such instruments, as it is necessary to employ a refracting medium having a higher refractive index than that of the substance to be tested, it is desirable to employ a medium having as high a refractive index as possible; such substances are
30 in themselves costly and hitherto it has been found necessary to employ a refracting medium of considerable size which has to be optically ground to produce the surface embodying a spherical or cylindrical surface to direct the light in the required directions. The object of the present invention is to provide a refractometer of the above type of simple construction having a refracting medium which is considerably smaller than those
40 hitherto employed. Another object of this invention is to provide improved viewing means for reading the refractive index of the substance being tested, and to this end according to the present invention the refractometer comprises a refracting medium of prismatic form and of small size, a lens disposed adjacent to one
50 face of the prism, an optical viewing system comprising one or more lenses and a mirror or reflecting prism and a graduated scale, the several parts being so arranged that light totally reflected within the refracting medium and at the surface of the substance being tested may be viewed in the mirror or reflecting prism and the refractive index read off on the graduated scale.

60 In the accompanying drawing
Figure 1 is a side elevation partly in

vertical section of a refractometer constructed according to one embodiment of this invention, with the side cover plate removed.

Figure 2 is a horizontal section on the line $x-x$ of Figure 1, and

Figure 3 is a similar view to Figure 1 illustrating a modified construction.

In the embodiment of the invention 70 illustrated in Figures 1 and 2, the refractometer comprises a shallow box or casing 1, having a cover plate 2, secured to one side thereof and a vertically disposed aperture 3 in the front end thereof 75 furnished with a window 4 of glass or other transparent material through which light can enter the box 1. The upper wall of the box 1 is formed with an inclined portion 5 on which is mounted an 80 eye-piece 6 of known form, and a horizontal portion comprising a plate 7 provided with a longitudinally disposed slot, the upper and outer face of the plate 7 being protected by a plate 8 hinged at 9 85 to the main part of the box 1. A small prism 10, composed of a medium having a high refractive index; for example, diamond, provided with two flat and polished surfaces, 11 and 12, is mounted 90 on the plate 7 in such a manner that the polished surface 11 extends into the longitudinally disposed slot in the plate 7 and so that the surface 11 thereof projects slightly above the top surface of the plate, 95 said prism 10 being retained in position by a clip 13 attached to the block 14. A lens 15 having a flat surface 16 and a spherical or cylindrical surface 17 is mounted to the rear of the prism 10 by 100 means of a clip 18 so that the flat surface 16 thereof is disposed adjacent the polished face 12 of the prism 10. A third face 19 of the prism 10 is directed towards the window 4 in the front of the box 1. 105 The optical viewing system, in addition to the eye-piece 6, comprises within said box a lens 20 mounted by means of the clip 21 to the rear of the lens 15 and a mirror 22 mounted in a bracket 23 to the 110 rear of the lens 20 and at an angle of about 45° to the axis thereof so that light which is transmitted through the lenses 15

and 20 from the prism 10 is reflected by the mirror 22 up into the lens of the eye-piece 6 on the box. A plain sheet of glass having a graduated scale engraved or otherwise produced thereon is mounted in a bracket 25 within the box 1 below the mirror 22 and at right angles to the axis of the eye-piece 6 so that when viewed through the eye-piece 6 the scale is seen disposed along one side of the mirror 22, which side is left unsilvered for this purpose. The interior of the base 26 of the box 1 below the sheet of glass 24 bearing the graduated scale is either painted white or has a sheet of white material fixed thereto to reflect light from the window 4 at the front end of the box 1 through said scale and up into the eye-piece 6, or if desired an aperture (not shown) may be provided in the base of the box 1 below the scale through which aperture light from a suitable source of illumination may be directed on to the scale and up into the eye-piece 6.

If desired, instead of the scale being seen disposed along the side of the mirror 22 as above described, the whole surface of the mirror 22 may be only thinly silvered so as to permit the scale located below the mirror 22 to be seen through said mirror, or alternatively said scale may be produced on or carried by a non-transparent support, a mirror being arranged to illuminate the upper surface thereof so that it may be viewed through the optical system as above described.

In the embodiment illustrated in Figure 3 a mirror 27 is mounted in a bracket 28 behind the window 4 and reflects the light passing through the latter upwardly through the face 19 of the refracting prism 10, said face 19 being directed downwardly towards the mirror 27. The optical viewing system in this embodiment, in addition to the eye-piece 6 and the lens 20 comprises a plain sheet of glass 29 having a suitable scale engraved or otherwise formed thereon, and a third lens 30 mounted to the rear of and coaxially with the lens 20 by means of clips 31 and 32 respectively and a reflecting prism 33 mounted by means of clamping brackets 34 to the rear of the lens 30 with its reflecting surface 35 at an angle

of about 45° to the axis thereof so that light which is transmitted through the optical system from the refracting prism 10 is reflected at the surface 35 up into the lens of the eye-piece 6.

In use the substance 36, the refractive index of which it is desired to ascertain, is placed on the upper surface 11 of the prism 10, the plate 8 (when the size of the substance permits) covering said substance as shown to prevent direct rays of light passing through the surface 11.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A refractometer comprising a casing having mounted therein a refracting medium of prismatic form and of small size, a lens disposed adjacent to one face of the prism, an optical viewing system, comprising one or more lenses and a mirror or a reflecting prism and a graduated scale, so arranged that light totally reflected within the refracting medium and at the surface of the substance being tested may be viewed in the mirror or reflecting prism and the refractive index read off on the graduated scale.

2. A refractometer as claimed in Claim 1, in which at least two of the faces of the refracting prism are flat and polished, on one of which the substance to be tested is adapted to be placed, the other of said faces being directed towards the adjacent lens and the optical viewing system.

3. A refractometer as claimed in Claim 1 in which the graduated scale is disposed exterior to the optical system and is viewed alongside of or through the mirror, said mirror in the latter case being only thinly silvered.

4. A refractometer as claimed in Claim 1 in which the graduated scale is disposed in the optical system and is viewed in the reflecting prism.

5. A refractometer substantially as described and illustrated in Figures 1 and 2 or Figure 3 of the accompanying drawing.

Dated this 9th day of September, 1936.
PHILLIPSS.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

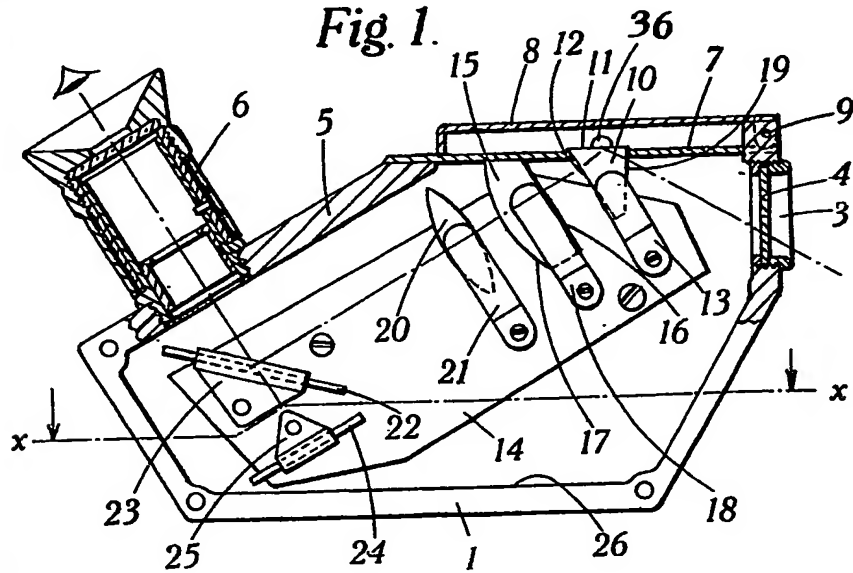


Fig. 2.

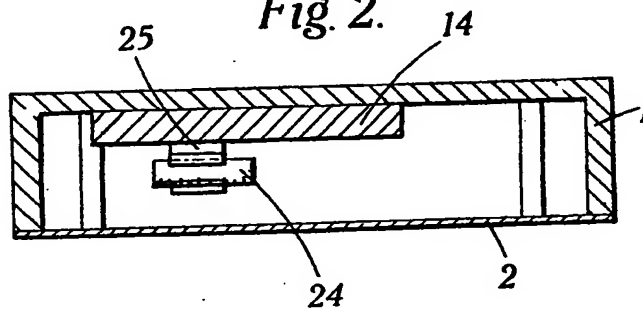


Fig. 3.

